

**ICEST 2022****III International Conference on Economic and Social Trends for Sustainability of Modern Society****ANALYSIS OF BLOCKCHAIN TECHNOLOGY USAGE FOR  
BUSINESS PROCESS MANAGEMENT**

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**Abstract**

Blockchain is a distributed data storage technology that contains information about all transactions of the system participants in the form of "blockchain". Blockchain offers a way to reliably execute processes, ensures stable operation, eliminates the possibility of duplication of information and reduces costs. The promising technology is rapidly gaining popularity and is being implemented in various fields, including business process management. However, while blockchain technology has been around for several years, many business leaders are still not familiar enough with it because little information is available, and blockchain technology has not yet been widely applied to enterprise infrastructure. Therefore, blockchain technology for business process management remains a hot topic, and the significant benefits of blockchain technology in improving business efficiency cannot be overlooked. Thus, this article will discuss the main features of blockchain technology use in business process management. The main advantages of technology implementation and its disadvantages are also given, the problems that may be faced by business executives are considered. In addition, the important aspects of using blockchain technology in business process management are analyzed.

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*Keywords:* Blockchain, business process management, electronic documents, execution logic, financial instruments

## 1. Introduction

The use of the latest information technology in all areas of human activity opens up new opportunities for optimizing business processes. Things that seemed unbelievable 15 years ago, such as online payments, electronic banking and virtual currencies, have become part of our daily lives. One of these technologies is blockchain He et al. (2016).

According to Osterwalder et al. (2016), we should not confuse "business process model," "business model" and "strategic planning. Although all three solve similar problems, they show different levels of abstraction in achieving an enterprise's goal. In his opinion, the activity of the enterprise should be considered at three levels:

1. Strategic planning - defines the goals of the enterprise, its mission and the value that the enterprise is able to offer to its customers.
2. Business model - describes the ways to achieve the goal of the enterprise by monetization of the value which is defined on the upper level. 3.
3. Business process model - defines the implementation of the business model developed above, and describes the organizational and economic relationships that exist between the employees of the enterprise.

According to Dumas et al. (2018), blockchain technology, which is still in its early stages, has the potential to radically alter the environment in which interorganizational activities can work. Even in a network with no mutual confidence between nodes, blockchains provide a method to conduct activities in a trustworthy manner. Specific algorithms that lead to node consensus and market mechanisms that drive nodes to advance the network are important features. This technology has the ability to change the conversation in BPM research about how systems might support the execution, monitoring, or optimization of business processes within or across corporate networks, thanks to these features.

Smart contracts, a new idea introduced by blockchain, are critical for corporate processes (Szabo 1997). Consider the case of the buyer who placed an order for 200 products from the vendor. Business processes are governed by rules that dictate how they should react to certain situations. If the seller fails not deliver within two weeks, for example, the buyer may be entitled to a penalty payment. Smart contracts can be used to express such business rules. The Ethereum blockchain, for example, includes a Turing-complete programming language for smart contracts. These languages' code is deterministic and based on the closed-world premise that only information saved on the blockchain is accessible in the runtime environment. A special sort of transaction is used to deploy smart contract code. The introduction of smart contract code to the blockchain is immutable, just like any other blockchain transaction. Smart contracts, once installed, provide a method to run code directly on the blockchain network, such as the conditional transfer of funds in our example if a specific condition is met.

Untrusted parties can create trust in the true execution of the code by using blockchain technology. Smart contracts can be used to implement interorganizational business procedures and business cooperation in general. The ability of blockchain-based distributed ledgers to promote collaboration in open contexts has been proven in a variety of sectors, including diamond dealing and securities settlement (Walport, 2016).

The objects of this study are business processes, reflecting sustainable organizational and economic relationships that arise in enterprises that implement process management using business process management tools (BPM). The term business process has a broad broad interpretation today, so it becomes necessary to clarify this concept, to classify business processes, which will clarify the direction of the study. Moreover, this study elucidates the essential aspects of blockchain technology and discusses initial research efforts at the intersection of BPM and blockchains.

## 2. Problem Statement

The concepts of "process" and "activity" are lexically identical, which leads to confusion and recursive definitions. Let us compare Deming's definition which has become classical - "a process is any type of activity in the work of an organization" and taken from the explanatory dictionary definition of the term "activity is a process of active interaction of a subject with the world, during which the subject meets any of his/her needs". There is a recursion - the term "process" is defined through the concept of "activity", and the term activity - through the process. Note that the term business in the broad sense is interpreted as "activity in general, and not only economic, but also business life, business circles, and entrepreneurship. The circle has definitively closed (Table 1).

**Table 1.** Hypothesis One Computation of PPMC Coefficient (r) using The Deviation Method

N	X	Y	X - $\bar{X}$	Y - $\bar{Y}$	(X - $\bar{X}$ ) <sup>2</sup>	(Y - $\bar{Y}$ ) <sup>2</sup>	(X - $\bar{X}$ )(Y - $\bar{Y}$ )
A	30	45	-0.6	14.2	0.36	201.64	-8.52
B	64	56	33.4	25.2	115.56	635.04	841.68
C	39	33	8.4	2.2	70.56	4.84	18.48
D	16	14	-14.6	-16.8	213.16	282.24	245.28
E	4	6	-26.6	-24.8	707.56	615.04	659.68
5	$\Sigma X = 153$	$\Sigma Y = 154$			$\Sigma(X - \bar{X})^2 = 2107.2$	$\Sigma(Y - \bar{Y})^2 = 1738.8$	$\Sigma(X - \bar{X})(Y - \bar{Y}) = 1756.6$

In process management, the type of activity characterizes the line of business in which an enterprise operates. For instance, what kind of activity does a bank do? If it is a credit bank, then it is a commercial bank, and if it provides financial instruments trading services, then it is an investment bank. A process is a way of doing business, it is always connected with the processing of a material or informational object, which is fed to the input and after conversion it forms the output. The result of the process execution must be individually identifiable and computable, while the result of the activity may not be countable. For example, we can accurately answer the question - how many marketing reports are issued in a week, but we are not able to determine how many marketing activities are performed in the same period Mike (2015).

Process and technology the specialist's goal is to fulfill the client's unique order. The result of his work will not be similar to previous orders, which is why some of his products become masterpieces, while others remain handicrafts. The technologist brings in a recipe or a method that guarantees the reproducibility of the result. If an organization produces a product, it wants all the products produced by the technology to be identical. To do this, it requires workers to do their work in a certain standard way. If

the organization provides services, it expects the product produced to meet regulatory requirements. It does this by requiring employees to perform their work according to certain regulations.

Business process is the technology to achieve a planned result. Technology in a broad sense is a set of methods, processes, tools and materials used in any branch of activity, as well as scientific description of technical production methods. Technology "in the narrow sense is a set of organizational measures, operations and techniques aimed at manufacturing, maintenance, repair and/or operation of the product with nominal quality and optimal costs, and conditioned by the current level of development of science, technology and society as a whole. For this purpose, technology proposes to decompose the work into elementary components, fix and regulate them. Thus, the requirement of reproducibility of results conditions the repeatability of activities performed by workers, but not vice versa. Repeatability of work is a necessary but not sufficient condition. It is wrong to treat a process as a sequence of repetitive activities because this does not guarantee a reproducible result.

The number of different definitions of the term business process is increasing; they are based on different, often mutually contradictory concepts. Let's analyze the known definitions of the term business process. For example, a process is:

- A set of different activities in which one or more types of resources are used "at the input" and as a result of these activities a product of value to the consumer is created at the "output" (Hammer & Champy, 2009).
- Any type of activity in the work of an organization.
- A set of interrelated resources and activities that transforms inputs into output.
- A stable, purposeful set of interrelated activities that transforms inputs into outputs according to certain rules using certain mechanisms (ISO/IEC 12207:2008, 2008).
- A set of internal steps (types) of activities starting with one or more inputs and ending with the creation of products needed by a customer (just a customer or process flowing in the company's external environment) and satisfying it in terms of cost, durability, service and quality (Oikhman & Popov, 1997).
- A set of logically interrelated actions performed to achieve a certain output of a business activity.
- A set of dynamically coordinated, jointly executed, transactional actions that provide value to customers (Smith & Fingar, 2003).
- A structured finite set of actions designed to produce a specific service for a specific customer or market.
- A specifically ordered set of activities, tasks in time and space, with the beginning and end specified by a precise definition of inputs and outputs.
- A structured, measurable set of activities designed to produce a specific output for a specific customer or market.
- An entity defined through entry and exit points, interfaces, and organizational devices that partially incorporate service/goods consumer devices, in which the value of the service/good being produced is built up (Porter, 1985).

- A logical series of interdependent actions that use enterprise resources to create or obtain in the foreseeable or measurably predictable future a useful output for the customer, such as a product or service (Zinder, 1996).
- An action that translates the input of a system object into an output (Nikanorov, 1969).
- A horizontal hierarchy of internal and interdependent functional actions whose ultimate goal is the output of a product or its individual components (Vernikov, 2012).

Note that some authors define the concept of business process through the term activity, while others define it through the terms work or operation, for example, definition 13 operates with the term activity, definitions 4-5 use both, and finally, definitions 5-14 rely on the term operation or action. Let us state that most definitions do not separate activity and operation; they mean repeatability of actions (though regularity does not guarantee reproducibility of the result); they speak about transformation of inputs into outputs (though not any operation of a process is connected with transformation); they mention creation of value for a customer (though auxiliary processes do not create value for a customer). This necessitates a redefinition of the term.

### 3. Research Questions

Business process is a technology (in the narrow sense) of production of goods and services, the latter, in contrast to material production, are not always materially embodied. We will consider that the reproducibility of the results is the most important criterion, allowing us to distinguish business processes from other activities. Let's define business process as a set of interrelated operations aimed at reproducible and repeatable result. In this definition the emphasis is put on repeatability of process product properties, not process indicators; this means at the same time that each instance of the result can be uniquely identified, and the number of products received in a certain time interval can be counted (Table 2).

**Table 2.** Hypothesis Two Computation of PPMC Coefficient (r) using The Deviation Method

N	X	Y	X - $\bar{X}$	Y - $\bar{Y}$	(X - $\bar{X}$ ) <sup>2</sup>	(Y - $\bar{Y}$ ) <sup>2</sup>	(X - $\bar{X}$ )(Y - $\bar{Y}$ )
A	20	25	-3.8	1	14.44	1	-3.8
B	24	28	0.2	4	0.04	16	0.8
C	33	27	9.2	3	84.64	9	27.6
D	32	28	8.2	4	67.24	16	32.8
E	10	12	-13.8	-12	190.44	144	165.6
5	$\Sigma X = 119$	$\Sigma Y = 120$			$\Sigma(X - \bar{X})^2 = 356.8$	$\Sigma(Y - \bar{Y})^2 = 186$	$\Sigma(X - \bar{X})(Y - \bar{Y}) = 223$

The calculation of missing data was done by normal ratio method:

$$p_x = \frac{1}{M} \left[ \frac{p_1}{N_1} + \frac{p_2}{N_2} + \dots + \frac{p_m}{N_m} \right]$$

where,

$p_x$  = Missing annual precipitation at station X not included in the above M stations.

$p_1, p_2, \dots$  = Annual normal precipitation for station x

$N_1, N_2$  = Annual precipitation of the other station above M.

$M$  = Total number of stations – 1

The ISO 21500 standard defines a project as a unique set of processes consisting of coordinated and manageable tasks with start and finish dates undertaken to achieve a goal. It appears that a project consists of a process, but this is not true. A project is a set of activities related to the achievement of a planned goal that is unique in nature. The uniqueness of the goal means that the subject may at first have a vague idea of the intended result and the way to achieve it, so careful planning is required beforehand. If the way in which the work included in the project is carried out has shown to be effective, the organization may attempt to replicate these activities to begin to replicate the result. The project seamlessly becomes a process, not the other way around. Mixing the concepts of project and process is unacceptable. People often talk about the project approach, but they mean the process approach. For example, companies that want to reduce their costs want to do their work in a uniform and optimal way, rather than looking for the right solution every time. The proposed definition makes it possible to clearly separate the project and the process, using the reproducibility of the result as a criterion. The difference between technological and business processes. The above mentioned allows us to talk about the existence of significant similarities between technological and business processes, both describe the sequence of operations that transform input into the result with given characteristics, so that non-industrial companies, which strive to implement the methods of production organization, typical for industry, can count on achieving high levels of productivity and labor efficiency.

At the same time, business processes have a number of features that should be considered in the transition to process management.

The order of execution of operations of a business process is not linear, it has a complex logic of control transfer, including backwards for re-processing or overtaking forwards, bypassing some operations;

Decision-making logic in a business process is difficult to formalize as it often contains contradictory criteria and includes handling of exceptions and non-standard situations.

Business process is cross-functional by nature, it describes the interaction of several structural units and aims at overcoming the disconnection of their work:

A technological process usually characterizes the activities of a single, albeit large, production unit, it is more focused on the rhythm of work;

Description of a technological process captures the sequence of operations performed by participants, transforming input into output. Description of a business process includes, in addition, organizational activities which route tasks;

A technological process lacks complex organizational interaction aimed at coordinating the efforts of the participants. In a business process, organizational interaction takes into account organizational practices used in the enterprise.

Technological processes are usually much better formalized than business processes. Business process formalization does not mean that all jobs will be processed using the same process flow, like on an assembly line, but for each possible product the processing scenario is well known and formalized in advance.

A business process often changes following a change in the business environment, whereas changes in a workflow occur much less frequently.

Processes are usually classified according to the technology that is used in them. Business processes have a developed system of classification, which should be considered in more detail.

In addition to the above distinctions, business processes are characterized by an extensive system of classification, which should be considered when selecting a process for automation.

Classification methods of business processes Processes of a company can be systematized according to various classification attributes. The following are considered:

- Intra- and inter-organizational processes.
- Main, auxiliary and supporting processes.
- Cross-cutting processes.
- Well- and poorly formalized processes.
- Automated and automated processes.
- Intra-organizational processes and inter-organizational interaction.
- Intra-organizational processes describe interactions occurring within a single organization.

They are divided into main, auxiliary and management processes.

Inter-organizational processes are responsible for interaction of several enterprises connected by the tasks of common business. It could be the interaction of company with its client or cooperation partner. Such processes have increased complexity, because first it's necessary to standardize the performance of work within each of the enterprises, and then move to the standardization of their interaction.

The implementation of the processes of inter-organizational interaction usually takes place in two stages. In the first stage, organizations "agree" on the format of documents used in the exchange. At the second stage they agree on a sequence of operations for forwarding these documents. To accomplish the first task, organizations establish a common terminology to define the business terms included in documents sent between trading partners. For example, RosettaNet Consortium, a group of over 500 leading IT companies, created the industry standard of the same name for B2B communications. RosettaNet vocabularies establish a common terminology to define business transactions between trading partners, goods and services. On the basis of common dictionaries there are electronic documents, which are "understandable" to all participants of the exchange and can be "electronically" docked with the corporate systems of each participant. To solve the second problem, organizations standardize the sequences of actions for the exchange of electronic documents.

#### **4. Purpose of the Study**

The activity of any organization is aimed primarily at creating products or providing services of real value to its external environment. The main process is aimed at achieving the main goal of the company, in the course of its implementation a product or service is formed, valuable to the consumer. Management processes are a set of separate activities aimed to maintain and develop the organizational

system in order to achieve its goals. These processes do not create a result, valuable to the consumer, but without them it is impossible the normal existence and development of the enterprise.

Finally, the organization must purchase products and goods necessary for its core business, hire personnel, and conduct business operations. Supporting processes do not create value in the product offered by the enterprise. They supply the resources for all the activities of the organization and ensure the operation of the core and supporting processes.

Grigoriev and Kudryavtsev (2009) suggest calling end-to-end or enterprise-wide process a business process, closed on input and output for a customer, executed by several functional departments. End-to-end business processes run through the entire organization, crossing the boundaries of many functional units. For example, a customer approached the organization for a product or service. He places the order in the customer department. Next, the order passes through various internal departments. The economic department determines its cost. The production department executes the order. The accounting department records payment. Forwarding is responsible for shipping. Finally, the customer department again, which signs a document with the customer about the success of the product or service. In the organization where process management is implemented the customer sees only the client department and all the internal workings of the order fulfillment are hidden from him in a "black box". End-to-end processes seem to be monolithic, but in practice they are often split up into a network of interacting subprocesses. There are several reasons for dividing an end-to-end process into subprocesses. Firstly, it is desirable to single out reusable components which will simplify process system development and maintenance. Secondly, a model that does not fit on a standard sheet seems incomprehensible and complicated, so analysts group operations into subprocesses. Well- and poorly formalized processes are divided into well-structured and poorly structured according to the degree of formalization. However, there are currently no generally accepted criteria for classifying business processes by degree of formalization, which makes it difficult to select the tools that can be recommended for automating a particular type of business process. Let us propose criteria to determine the degree of formalization of a business process: Selection of the next performer. In a formalized process, the next participant is known in advance and his choice is standardized. For example, if a product costs up to \$100, the order is checked by an economist, and if its price is higher, then an employee with higher authority. If the choice of the performer is not formalized, however, we can say that the performer is unknown in advance. Selection of the next operation. In a formalized process the next operation is known in advance. But there are situations when the next action can be determined only after the previous one is completed. For example, in legal activities, the choice of continuation is possible only after the completion of the current trial, and there are several continuation alternatives, the choice between which is ambiguous and cannot be formalized, so each time is performed by a subject matter expert (Table 3).



**Table 3.** Hypothesis Three Computation of PPMC Coefficient (r) using The Deviation Method

N	X	Y	$X - \bar{X}$	$Y - \bar{Y}$	$(X - \bar{X})^2$	$(Y - \bar{Y})^2$	$(X - \bar{X})(Y - \bar{Y})$
A	40	35	4.6	2.2	21.16	4.84	10.12
B	76	68	40.6	35.2	1648.36	1239.04	1429.12
C	39	48	3.6	15.2	12.96	231.04	54.72
D	20	12	-15.4	-20.8	237.16	432.64	320.32
E	2	1	-33.4	-31.8	1115.56	1011.24	1062.12
5	$\Sigma X = 177$	$\Sigma Y = 164$			$\Sigma(X - \bar{X})^2 = 3025.220$	$\Sigma(Y - \bar{Y})^2 = 2708.8$	$\Sigma(X - \bar{X})(Y - \bar{Y}) = 2876.4$

Usually there is a control object associated with each process, such as a document whose movement along the process determines the execution status. For example, the issuance of credit begins with the filling of a document called an application, its movement between the participants determines the course of consideration, the participants put their visas on the application. The information object of the application formalized, if it is divided into fields, each of them has a unique name identifier, allows you to store data of a certain kind. Formalized documents are convenient for machine processing. But there are non-formalized documents, for example, the same request can be described in plain written form without a template and special rules, so to understand where in the request the customer and the delivery address of the machine cannot.

BMS. In the other extreme, where the participant and his or her action are unknown and the document is not formalized, collaborative tools are best suited. Using BMS systems for weak and poorly formalized processes is possible, but in this case they will not reach their full potential and capabilities of the BMS.

Business processes can be distinguished by the degree of human involvement in production activities. Automated processes occur with human involvement in the control loop. Automated processes take place without human involvement. The former is interactive, they are based on two-way dialog between the human executor and the central executing node, which perceives input of commands and data from the user during operation. The latter are executed without human intervention; all the work is done by the machine. The differences are as follows: machine operation is possible when the task is fully formalized, all decision criteria are known precisely. In this case each operation is accepted as a service. Having given the required data as input, we have the right to expect the expected result at the output. In an automated process decisions can be less formalized. It is assumed that a person can make a decision using personal experience and skills. But this introduces a certain subjectivity in the execution of the process, a person often performs the work according to personal views, interests or tastes, as a result there is a variability in the execution of the process.

In the industrial sphere, the main processes are technological, they are automated with the help of industrial automation, which uses specialized industrial IT systems. In industry, the introduction of IT occurs most often in auxiliary, service processes (procurement, warehouse, accounting) that do not contain production know-how, so companies more easily agree to borrow the best practices of others. On the contrary, in the non-industrial sphere the main processes are often automated, so the issue of copying other people's practices is much more difficult to solve.

## 5. Research Methods

The analysis allows us to conclude that there are no fundamental differences between technological and business processes, so that non-industrial companies that strive to implement industry-specific methods of production organization can expect to achieve high performance indicators of productivity and labor efficiency. At the same time, business processes have a number of peculiarities that should be taken into account in the transition to process management.

Business processes have a more complex execution logic, which will inevitably affect the cost of identifying, modeling and regulating these processes. This raises the question, to what extent the methods of identification, modeling and regulation of the model, developed in relation to manufacturing processes, are applicable to the automation of enterprise business processes?

Technological processes are less focused on description of interaction of execution participants. On the contrary, organizational interaction of participants of a business process is an essential component to achieve a synergistic effect from the coherence of their work. This raises the problem of finding new methods to identify and describe organizational interaction of business process participants.

Business processes change much more often after a change in the business environment than technological processes. If every change leads to the need to modify models, the cost of updating them would be unacceptably high. This raises the question arises about creating models that will be invariant to at least part of the changes in the external environment.

Business processes have a more developed system of classification, but the main factor that has a significant impact on the choice of automation tools is the degree of formalization of the business process.

A set of criteria which allow you to determine the degree of formalization of business process model, help you to choose the most appropriate automation tool.

A class of cross-functional, intra-organizational business processes, for which the use of BBS is the most promising. The transition of non-industrial enterprises to the methods of work organization, typical of industrial enterprises is, in the author's opinion, an important factor in increasing of labor productivity, efficiency and quality. The conceptual apparatus of process management has a specific definition, let's analyze the economic concepts of the research area.

Let's consider classification of information systems, taking as a basis the ways of using business processes in them. Features of design functionally-oriented information systems In the framework of the functional approach it is proposed to consider the system (organizational or information) as a "black box". The observer is interested in what the system does, thus he abstracts from its internal structure and from details of implementation, considers relations of the system as a whole with objects of the environment lying outside of it. According to Markov (1982), "the function of the system can be called everything that can be learned about the system without touching its internal content, abstracting from it" (p. 35). In this case, we are not interested in the internal structure of a device, but it is important what it is intended for. The function can be realized in different ways. For example, an electronic clock and a mechanical clock have the same function. Function-oriented information systems automate a set of functions performed to achieve a planned result. The order in which these functions are performed is not specified, because it is controlled by the executor. In a function-oriented IT system, the executor plays an active role - it

determines the order of execution of functions, and the system plays an auxiliary role - it automates the necessary operations. If any execution scenario was not identified during the design of the information system, the implementer can tweak the situation. As a consequence, the user must keep in mind all scenarios of execution of the process, so that the work in such a system requires preparation and training. Thus, when designing a function-oriented information system, it is critical to identify all of its functions, but not so important if all process execution scenarios are not identified. Accordingly, designing a function-oriented system requires less time. Let's define a process aware information system as one that was designed using a business process model.

For example, introduction of the majority of enterprise resource planning (ERP) systems starts with process modeling, but can we say, that these ERP-systems were created for realization of process approach? In a situation like this, modeling is usually done once for the purpose of writing a technical specification, the schema quickly loses relevance. It becomes difficult to change process scheme, once implemented in such system.

Process-oriented systems organize interaction between participants with each other and with information systems in such a way that tasks, including information and documents, are transferred between participants (people and systems) in compliance with formalized procedural rules. This class includes workflow systems. Process-oriented systems play an active guiding role, determining the order and timing of operations, and humans are subordinate, their participation is reduced to the execution of tasks.

Practice shows that uncoordinated activity of high-class specialists is less effective than well-organized work of employees with ordinary qualifications. The effect of coordination of interaction becomes apparent in the fact that procedures become shorter, their implementation is less costly, quality increases. Process-oriented systems are aimed at getting synergy effect from coordinated actions of company's organizational units. We can say that process-oriented systems are created to implement process approach.

Business process model is a formalized (graphical, tabular, textual or symbolic) description, reflecting actual or expected activities of a company. It's a template on the basis of which instances of business process are created in the system. Notation (modeling language) is a system of symbols adopted in models of a particular type. Thus, a model can be considered as a set of symbols (belonging to notation) adequately describing the activities forming the process and the relations between them. Researchers and software developers have long sought to create abstractions to help develop information systems in terms of the goals of their project rather than the computer environment being used. Initially, programming languages were created to hide the details of operating systems, now we are talking about the development of business applications in terms of concepts of the subject area. This way the developer is protected from the complexities of the computer environment, the amount of manual work for coding is reduced, debugging and transfer of programs is reduced. Computer systems that are developed in terms of the subject area that is being automated are called model-driven (Morris, 2016).

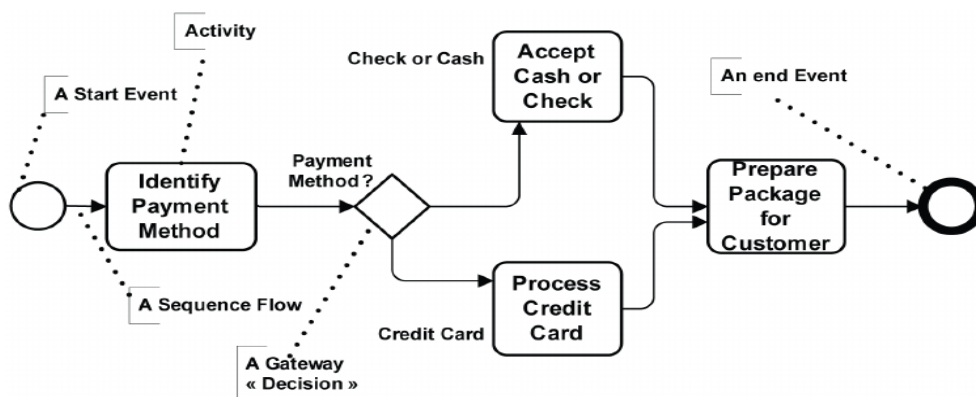
The executable model of a business process is a model-driven description of the participants of the process: people and machines, as well as the order and time of their operations and actions, which can be used for automating the interaction of participants with each other and machines without additional

coding and programming. An executable model describes the dynamics of behavior of an organizational system. It can be assumed that it is significantly more complex, more voluminous than the business process diagram used for the purpose of analytical description of a business process.

An executable process model includes several projections (layers), each of which describes individual aspects of an organizational system, and all of which together describe the dynamics of its behavior. Model-oriented development of IT systems based on BMS The essence of model-oriented development of process-oriented systems is that an executable program code is generated directly from a visual, graphical business process model created in the industry-standard BPMN business process modeling notation. Due to the fact that the visual model of the business process is taken as the basis, the center of gravity in the development moves from the programmer to the business analyst.

## 6. Findings

BPMN (Business Process Model and Notation) is a standard graphical representation of the elements for describing business processes (BP) in BPM (Business Process Management). Traditionally, BPM is considered an internal system of the organization. In other words, large organizations create BPs to streamline the management processes used internally. Sometimes BPs are used between two organizations when there is a high level of trust. BPs can be very, very large, don't fit in the monitor, wadding, etc., consist of many sub-processes, Decision Tables, and more. An example of a simple business process (Figure 1):



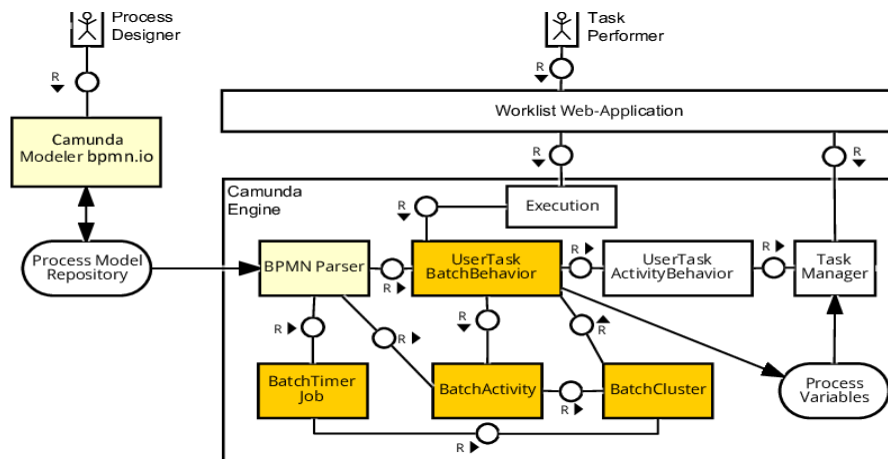
**Figure 1.** An example of a simple business process

Analyzing the above, we conclude that the blockchain algorithm could be used to optimize business processes between different organizations. In this case, the organizations involved in the business process get a reliable source of data that cannot be faked; the analysts get the ability to create a BP in a familiar way.

There are two applications:

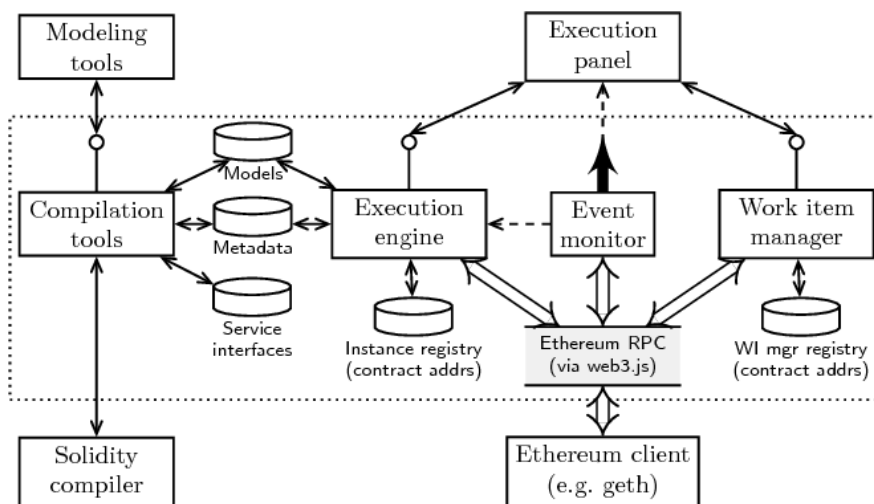
1. Creating contracts for blockchain using business processes as a substitute for programming;
2. Creating business processes where critical data is stored in blockchain (respectively inheriting security and validity properties) and stored there to validate process execution.

Let's consider the proposal with an example, for demonstration we use Ethereum test network - <https://rinkeby.etherscan.io>. This network is similar to the main one, the only difference is the technical details of the algorithm, it should be noted that it is simpler to organize and is made specifically for developers. We have chosen Camunda as a basis for BPMN development environment. Camunda is one of the most famous worldwide creators of tools for BPM (Figure 2).



**Figure 2.** Implementation of BPMN in a Camunda environment

The BP on blockchain looks like this (Figure 3):



**Figure 3.** Blockchain-based business process

In the future, this approach will enable significant optimization of business processes. We would like to assume that one day all organizations (both large and medium-sized), will interact in a similar way to reduce their costs and automate processes, while making them transparent.

In conclusion, blockchain is not a single item, item, trend, or property. It is many parts at once, some of them working together and others autonomously. Blockchain develops this plurality of functions further Atsori (2016). It simultaneously performs the following ten functions:

1. Cryptocurrency.
2. Computational infrastructure.
3. A transactional platform.
4. Decentralized database.
5. Distributed registry of accounts.
6. Development platform.
7. Open source software.
8. Financial services marketplace.
9. The peer-to-peer network.
10. Level of trust services.

## 7. Conclusions

Thus, blockchain technology for business process management combines a number of important advantages (reliability, stability and autonomy) as well as disadvantages (e.g., resource-intensiveness). Moreover, blockchain is applied at every stage of the BPM lifecycle. Using blockchain technology to manage business processes implies great opportunities. First and foremost, collaboration between different organizations is greatly enhanced, because inter-organizational processes using blockchain technology mean secure and transparent collaboration. The ability to use smart contracts simplifies the transaction process by automating the fulfillment of obligations. At various stages of the life cycle, blockchain solves pre-existing problems. When combined with existing technologies, blockchain becomes an effective tool for managing business processes.

Thus, the use of a combination of these services, like building blocks in a building, makes it possible to create and use different operational schemes in the financial, banking, insurance and tax domains already now.

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